RECORDS

OF THE

BOTANICAL SURVEY OF INDIA.

PUBLISHED UNDER THE DIRECTION OF
BRIGADE-SURGEON G. KING, M.B., LL.D., F.R.S., C.I.E.,
DIRECTOR OF THE BOTANICAL SURVEY OF INDIA.

VOLUME I.

No. 2.

REPORT ON A BOTANICAL TOUR IN SIKKIM,

BY

G. A. GAMMIE.

CALCUTTA:
OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.
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REPORT

ON

A BOTANICAL TOUR IN SIKKIM,

1892.

I departed to collect botanical specimens in Sikkim and on its frontiers on the 6th June 1892. As Mr. White, the Political Agent, informed me that he would probably be at liberty to accompany me on a journey to the little known district of Lhonak, I arranged to meet him at Guntok in about six weeks' time, when we should make the necessary arrangements for our travelling together. To my regret the exigencies of his appointment prevented him from carrying out his intention, and I was obliged to abandon the idea of going alone to Lhonak, as Mr White considered it inadvisable on my part to attempt it while important negotiations concerning the frontier were pending with the Tibetans.

He kindly forwarded to me parwanas written in Tibetan and addressed generally to the headmen of villages, ordering them to render me whatever assistance I required; but at the same time he wisely advised me not to depend on procuring carriers or supplies from the inhabitants. His passports were of the utmost value to me on the rare occasions I had to avail myself of assistance from the villagers, a service these indolent people would have been loath to afford me had I not been supported by such indisputable authority. As I had no hope of procuring supplies in the country, I made thorough arrangements for food sufficient for all to be sent at intervals to different stations, regulating my movements in accordance with the plans laid down, thus, at all times, avoiding a possible scantiness of rations, which would have disheartened my men and caused their desertion, a most undesirable contingency.

The slothful and improvident habits of the inhabitants prevent them from growing more grain than is actually necessary for their bare subsistence, a condition of affairs concomitant with their lack of mercantile enterprise, which is probably due to their isolation from the outer and more civilized world.

Being thrown on my resources, and having permission from Mr. White to travel in any part of the country, excepting Lhonak and

Cholamoo, I decided to devote the remainder of the allotted time to exploring the Lachung Valley with its ramifications, the Lachen Valley and the Chola Range from Tumloong to the Zeylap La, from whence I could return to Darjeeling by the Gnatong road.

In anticipation of the meeting with Mr. White, I considered that the first month of deputation would be most usefully spent in traversing the Singalelah Range to Kinchinjunga, from which I could march to Guntok by way of Yoksun.

As I was requested to confine my attention as much as possible to the collection and observation of temperate and alpine vegetation, that of low elevations being already well understood, I must omit anything but casual mention of the tract between Yoksun and Tumlong, and also the valley of the Teesta to the junction of the Lachen and Lachung. This restriction divides my narrative into three parts—the first dealing with the vegetation of the exceedingly moist mountains forming the western boundary of Sikkim, the second with that of the temperate and drier territory north of the junction of the Lachen and Lachung, and the third with that of the Chola Range.

First Tour. Journey along the Singalelah Range to the tracts on the southern flank of Kinchinjunga, and the march across the valleys of the Ranjit and Teesta to Tumlong.

This excursion lasted from the 7th June to the 7th July. The rainy monsoon broke with almost unparalelled severity on the day of my departure, and the most interesting portion of the journey, namely, that at high elevations, was accomplished through incessant fogs and storms of wind and rain. I thus enjoyed few opportunities of viewing the surrounding scenery, and had perforce to confine my observations to the vegetation within access to practicable paths.

The Singalelah Range is an elevated mountain mass, springing from the face of Kinchinjunga, and extending southwards to the plains of India. Owing to the facilities of travelling afforded by the Nepal frontier road to Phalut, the range so far is much frequented by general travellers, and is in consequence too well explored to induce one to linger on the way in search of novelties. Some Yew trees (*Taxus baccata*) grow close to the road beyond Tonglu, and *Abies Webbiana* is first seen on the last ridge between Tonglu and Sandakphu, from whence onwards it exists in profusion up to 13,000 feet in elevation, covering mountain sides with dense and sombre forests. There are trees of *Tsuga Brunoniana* below Phalut, and *Juniperus pseudo-sabina* abounds near the path to Cheabhanjan, but the other species of Conifers, so characteristic of drier

Sikkim, are altogether absent. Above 11,000 feet the most notable plants are Aconites and *Meconopsis Wallichii*, and a few species each of the genera *Ranunculus*, *Anemone*, *Potentilla*, *Primula*, etc. *Fragaria Daltoniana* occurs here and there, bearing narrow oblong fruits, reminding one of small strawberries and resembling them in flavour. The road from Sandakphu to Phalut passes through a forest of *Abies Webbiana*, associated with *Pyrus foliolosa*, *Betula utilis*, *Acer caudatum* and *Prunus rufa*, etc., underneath which are thickets of various Rhododendrons and two species of bamboo. One of the latter is *Arundinaria spathiflora* which flowered two years ago, a fact attested by the dead culms still bearing the withered spathe-like sheaths of the inflorescence. Its average height is 10 to 12 feet. The other is what Mr. Gamble named *A. Gammieana* from specimens of the foliage only; but, having since examined flowers, he has discovered it to be *A. racemosa*, Munro, a plant which, although so abundant round Darjeeling as to be almost exclusively used as fodder for ponies, has never been known to flower there. The Phalut plant, which differs so much in size and appearance, having reddish stems with an average height of 3 feet, may of course owe its diminutive size to the more rigorous climate of higher levels preventing its attainment to a normal growth. These two bamboos, the most Alpine species in Sikkim, grow in impenetrable scrubs in the same spongy soil which affords support to Rhododendrons and Pines.

On the slopes immediately below the summit of Phalut arboreal vegetation is scanty and confined to sheltered ravines. The ground is everywhere covered with a sward of herbaceous plants. *Anemone rivularis* with blue and white flowers predominates. *Primula rotundifolia* and *P. sikkimensis* (the latter affecting marshy situations in company with *Calathodes palmata*) are common. *Meconopsis Wallichii* is extremely abundant. The Bhutias eat the young stems of this plant, and the shoots of a *Polygonatum* are much esteemed by the Gurung shepherds. The young shoots of bamboos are cooked and eaten. *Rheum acuminatum* is prevalent throughout the whole of Alpine Sikkim, but is not utilized as food. *Allium Wallichii*, which is equally abundant, is consumed largely, sharing with the common onion the reputation of being an efficacious antidote against the physical discomforts experienced by men and animals at high elevations.

From Cheabhanjan onwards to Kinchinjunga, the only available path is that used by the shepherds, who pasture their flocks along the whole range during summer. For many miles this track follows the contour of the spur's crest, so that every day's march comprises many descents and ascents. As might be inferred from

the proximity of the path to the ridge, streams supplying a sufficiency of water for our camp were few and far between, often necessitating long marches to obtain our two chief *desiderata*—a space large enough to contain our tents, and water for cooking. At the end of the first day we found such a place at Ewanangi, a halting stage for shepherds. Its elevation by B. P. thermometer was 11,174 feet. The camping ground was covered with young plants of the formidable *Cnicus eriophoroides*, a large thistle. At the commencement of this march we struck the Islumbo Pass, and continued in a northerly direction. The path runs through woods of *Rhododendron arboreum*, *R. cinnabarinum*, *R. Falconeri*, *R. barbatum*, and *R. Hodgsoni*, *Acer caudatum*, *Betula utilis*, *Pieris ovalifola*, *Juniperus pseudo-sabina* *Abies Webbiana*, *Prunus rufa*, *Arundinaria spathiflora*, etc. These trees grow so densely that very few herbaceous plants exist beneath them. *Saxifraga ligulata*, a few species of *Polygonum*, Ferns of two species, and several species of *Potentilla* being most in evidence. A variety of beautiful mosses grow on the rocks On open knolls the soil is carpeted with *Gaultheria nummularia*, and the heather-like *Cassiope fastigiata*.

The following day's march was from Ewanangi to Megu. Two Gentians become common about 12,000 feet. One, *Gentiana stylophora*, with large, terminal, greenish, lily-like flowers, the other *Swertia Hookeri*, conspicuous by its brown leaves and inflorescence growing together in whorls on a stem often six feet high. A white and pink *Primula* is common · *Rhododendron Anthopogon* is abundant. Its fragrant leaves are largely collected and burned as incense in Buddhist temples. Small trees are represented by the species of Rhododendron formerly enumerated, by *Pyrus foliolosa*, *Prunus rufa*, and the bushy variety of *Juniperus recurva*, which forms excessively close thickets. *Spiræa bella* and *Pyrus rhamnioides* grow in open situations. *Clematis montana* with large white flowers climbs over bushes and at once arrests attention. A succession of steep ascents and descents where we first saw plants of *Meconopsis simplicifolia* in flower nestling under Berberry bushes, was followed by a comparatively level path running over the rocks of a glacial deposit, at the end of which lay the large and grassy flat of Megu, the elevation of which by B. P. thermometer was 12,767 feet. Its bright green surface was interspersed with many plants of white primroses and yellow *Calathodes*, a refreshing sight after travelling through such a long waste of *Rhododendron*. A colony of marmots lived in the rocks above the camping ground. I always understood that they avoid the damp climate of the Sikkim mountains and live only in the dry regions beyond the snows. The tailless rat, another denizen of the same dry

climate, was represented by numerous individuals scampering amongst the Rhododendrons. A great extent of land beyond the camping ground is swampy and covered with *Rhododendron campanulatum* The stepping stones across the wettest parts are formed of slabs of a slate-like gneiss which are resonant when struck. Various species of *Sedum* of the section *Rhodiola* and the golden *Chrysosplenium alternifolium* are common in the clefts of stones, partly submerged in the water. The ridge above is steep, and its black barren crags of foliated gneiss present a most forbidding appearance.

The following day we marched to Gambothan. Since we left Phalut our marches had been along the crest of the Singalelah, excepting when we rarely descended to and traversed the Nepalese side; but here the path after running through the swamp at Megu, ascends steeply and passes to the Sikkim side through a narrow depression guarded on each side by weatherworn cliffs. Grass covers this ascent, and the bright blue flowers of *Primula pusilla*, *P. glabra*, and *Delphinium alpinum* give an unique character to the place by their plentiful presence. In the clefts of a rock we found a small simply pinnate *Polypodium* and a species of *Pellæa*.

The tract into which we emerged wore a different aspect to that we had just left. Above us towered enormous walls and pinnacles of bare rock, intersected by equally stony valleys, all tending towards the broad and terraced slope over which we marched without difficulty. *Rhododendron Anthopogon* and *R. setosum* were the only woody plants. On the sides of the rocks along the terraces *Saxifraga imbricata* and *S. Jacquemontiana* grew in dense moss-like cushions spangled with white and yellow flowers. The soil is covered with a thick turf of grass and sedges, amongst which are innumerable plants of *Primula Stuartii* and a species of *Anemone*. Beyond this first terrace the route led over alternate flats and ravines, and passed four lakes. At first the rocks near the path are scattered singly over the ground; further on the whole surface of the hill is covered by a confused mass of glacier-deposited boulders, where the path is marked at intervals by upright white stones. Very little vegetation, except moss, maintains an existence in this wilderness. Sir Joseph Hooker in his admirable account of the Physical Geography of Sikkim, thus explains the cause of this barren desolation:—"Glaciers, again, descend to 15,000 feet in the tortuous gorges which immediately debouch from the snows of Kinchinjunga, but no plants grow on the debris they carry down, nor is there any sward of grass or herbage at their base, the atmosphere immediately around being chilled by enormous accumulations of snow, and the summer sun rarely warming the soil."

Attaining a ridge marked by a rudely built monument bearing a

small flag, we descended a steep gorge down which a stream urged its turbulent course. Its bed was cumbered with gneiss blocks, with many of a fine grained granite, transported from higher levels. This stream effects a junction with two others to form the Rangbi river at a flat expanse called Gambothan. The sheltered situation of this place favours the growth of large pine trees and copses of a willow, *Salix Wallichiana*, fringe the river bank. From eastward another tributary flows through a broad grassy valley, which rapidly attains a high elevation, and for a short distance towards the south the united rivers flow calmly through a forest of *Abies Webbiana*. The most noteworthy plant growing in the desolate locality we had traversed is the gigantic Rhubarb, (*Rheum nobile*), always associated in the traveller's mind with barren precipices where it delights to grow, and where it heightens the weird effect of such scenery by its cadaverous stave-like stems; for only by closer inspection can the actual beauty of the plant be realized. The only perfect specimens existed on inaccessible rocks, as the shepherds collect and devour all they find within reach.

The elevation of Gambothan, by B. P. thermometer, was 12,400 feet

Leaving Gambothan, a steep ascent was made to the summit of the ridge—13,300 feet in elevation For half the distance there is a scattered forest of *Abies Webbiana*, *Juniperus recurva*, *Rhododenaron campanulatum*, *Prunus rufa* and *Betula utilis*; the upper part being almost wholly occupied by *Rhododendron Anthopogon* and *R. setosum*. These when bruised or trodden upon exhale a strong perfume from the superficial glands with which they are covered, aggravating the headaches to which all are subject at high elevations. *Gentiana stylophora* is exceedingly common. Beyond the ridge is the broad open summit of Bokto, covered with grass on which two large flocks of sheep were feeding. From this a descent has to be made into the valley of the Yangsap through dense growths of *Rhododendron*, *Abies Webbiana*, *Pyrus foliolosa* and *P. microphylla*; beyond is a steep hill almost devoid of vegetation and covered with boulders. The path winds up its right flank to a depression below its summit at about 14,000 feet elevation. There is a fine wood of *Juniperus pseudo-sabina*, and the shrubby vegetation mainly consists of a *Berberis* not yet in leaf. Descending somewhat, we crossed two small plains with a steep low ridge intervening. On these level tracts intersected with sheep walks it would have been almost impossible to keep the proper paths had not the shepherds marked them with upright slabs of stones at regular distances. Leaving the second plain, a steep scramble along the inclined foot of an

enormous black gneiss cliff brought us to the bank of the Ratong river, on whose further side we camped on a flat grassy knoll, the only cleared spot in a waste of Rhododendrons.

Next morning we took the Kanglalama path and continued up the valley towards the north-west. We crossed one or two alternating flats and transverse ridges, and surmounted a high spur coming out on a large plain rendered exceedingly swampy by a network of shallow streams. It seemed of very large extent, but we could not define its boundaries through the fog. There was no inducement to stop or proceed further in this direction; so we retraced our way to within a short distance of our last camping ground, and then ascended a grassy slope to the east. The descent on the other side led steeply through grassy pastures in which grew a species of *Astragalus* and a dark purple species of *Anemone*. The floor of this valley is also a succession of terraces each terminated by a bank over which the river pours in masses of foam. There are signs of a more varied vegetation later in the season, but at present there is very little scope for botanising.

Primula denticulata and *P. reticulata* resembling *P. sikkimensis* grow on the verges of watercourses. The valley lower down descends precipitately and the flanks of its spurs are clothed with Pine forests. The next day we halted at this place, called Rongjing by the shepherds. As rainy weather had prevailed without intermission since the commencement of this expedition, my men were quite disheartened; and, being afflicted with complaints induced by wet and cold, they begged me to hasten into the warmer valleys of Sikkim.

Being reluctant to subject them to further hardships in this inhospitable region, I acceded to their request and informed them that I should go to Yoksun after spending a few days at Jongri, a locality which I was anxious to see, as it was the goal of one of Sir Joseph Hooker's most heroic expeditions.

Returning to Tegyap La we followed the course of the Ratong for about a mile, crossed it by a bridge and travelled eastwards up a very steep hill covered with Rhododendrons; *Cryptogramme crispa* was plentiful along the path. The entrance to the undulating top of Jongri is marked by a shallow lake said to be dry in the winter. We camped on a terrace immediately below two stone huts. Many plants were springing up amongst the grass, but the only ones in bloom were *Potentilla pedunculatis, P. microphylla, P. coriandrifolia, P. albifolia; Primula reticulata, P. Stuartii, P. pusilla, P. glabra; Pedcularis siphonantha, Geranium polyanthes, Ranunculus affinis, Meconopsis simplicifolia and Phlomis sp.* A majestic species of *Meconopsis* grew near the huts in dense clusters 2 to 3 feet high. The flowers

vary in diameter from 5 to 7 inches, are of an intensely vivid blue on opening and change afterwards to purple. I was informed by the Bhutias that it was not a native of Sikkim, but had been introduced by them from Nepal. The mountain top of Jongri, which is admirably described by Sir J. D. Hooker, is formed of alternating knolls and hollows ranging from 13 to 14,000 feet. Much of its surface is covered with *Rhododendron Anthopogon* to the exclusion of other vegetation. To the east of the camping ground is a wood of Rhododendrons, mostly *R. lanatum and R. campanulatum.* About 12,500 feet, *Primula pulchra* flourishes on the rocks.

After staying a few days at Jongri I marched down to Yoksun. For about a mile the path runs eastward along Jongri, and then descends steeply for 7,000 feet, enabling one to pass in review the gradation of vegetation from alpine regions to the subtropical zone. A few gigantic Yew trees grow a little above the Ratong. After crossing the Ratong, we travelled along the slopes on its left bank by one of the most difficult and dangerous paths in Sikkim to Yoksun. This place is unique from its peculiar formation amidst such precipitous surroundings. The copsewood which once enhanced the beauty of the flat is now reduced to a gaunt gathering of pollarded and charred trunks, but the beautiful little lake is still surrounded by forest trees. Here, and everywhere in Sikkim at the same elevation, there are large areas covered with *Edgeworthia Gardneri.*

I halted for two days to allow my men to recuperate in such a congenial climate. *Polypodium rostratum*, so rare in the Darjeeling district, is the commonest fern here. As Mr. Gamble once told me that Mr. Levinge had found it growing on the same *rhizome* with *Drymoglossum carnosum*, I searched carefully for a confirmation of the fact, but I failed to find any instance of it: indeed I did not perceive one plant of the latter species.

Variety of ferns is a notable feature of Yoksun. The commonest are *Polypodium rostratum, P. membranaceum, P. lineare, P. Boothii, P. fissum, P. amœnum. P. lachnopus, P. argutum, Nephrodium hirtipes*, various varieties of *N. Filix-Mas*, two forms of *Aspidium aculeatum* one of *A. auriculatum, Oleandra neriiformis, Pteris aquilina, P. Wallichiana.* Of orchids I observed *Malaxis sikkimensis, Microstylis biloba, Cœlogyne ochracea, C. cristata, Otochilus* sp, *Eria alba, Cymbidium Hookerianum, Dendrobium chrysanthum, Saccolabium calceolare* and a species of *Calanthe* in leaf. *Remusatia vivipara, Amorphophallus sp., Arisœma speciosum, Hedychium coronarium* and *Piper nepalensis* were common on the rocks. The principal trees are *Erythrina arborescens, Castanopsis tribuloides, Pteris ovalifolia*, and two species of *Aralia.* The shrubby

vegetation is composed of *Mæsa rugosa*, *Edgeworthia Gardneri*, *Dichroa febrifuga*, *Camellia drupifera*, and a few other species. The villagers grow clumps of a *Bambusa*, and a few plants of *Arundinaria Hookeriana* have recently been planted near the lake. This beautiful bamboo abounds in Sikkim from 5 to 7,000 feet, and is the kind exclusively used for roofing temples and houses. For this purpose the culms are cut into short lengths, flattened out and laid on as shingles. These are said to be very durable and to make perfectly watertight roofs.

The cultivated crops are buckwheat, millet and a little maize. After the grain is sown no care is taken to keep fields in proper cultivation. One enclosed plot was full of ganja plants (*Cannabis indica*) in splendid condition.

From Yoksun I marched to Tumlong through tropical and sub-tropical vegetation similar in all respects to that of the Darjeeling district.

By comparison with the drier regions of Upper Sikkim which I afterwards visited, I considered that the main characteristic of the vegetation along the Singalelah Range is its poverty in variety of forms and its superabundant wealth in individual species of Rhododendrons. I only collected about 200 species of plants in flower and fruit. There was, however, evidence to prove that the floral harvest would have been more remunerative later in the season. Sir J. D. Hooker, in his appendix on the Physical Geography of Sikkim, states "the banks (of rivers) between 8,000 and 14,000 feet are generally covered with Rhododendrons, sometimes to the total exclusion of other wooded vegetation, especially near a snowy mountain, a cool temperature and great humidity being the most favourable conditions for the luxuriant growth of this genus." Such conditions prevailing throughout the Singalelah Range, due to its proximity to Kinchinjunga account for the overwhelming abundance of Rhododendrons, and may also be accepted as probable reasons for the comparative absence of herbaceous plants (in ordinal and generic forms), which are unable to maintain a struggle for existence in such an adverse climate and against such formidable competitors.

2nd Tour. The Lachung Valley.—I arrived at Tumloong on the 7th July, and was detained there until the 24th waiting for supplies which were delayed by the break of communications caused by the excessive rains,

Immediately on their receipt I commenced my second excursion and marched through the hot tropical valley of the Teesta, arriving at Choongtam, at the junction of the Lachen and Lachung rivers, on the 28th. Near Choongtam a remarkable transition from tropical

to temperate vegetation takes place with no palpable increase of elevation. *Cnicus involucratus*, *Astragalus pycnorhizus*, *Eupatorium cannabinum*, *Anemone vitifolia*, and a few other plants served to accentuate the change. *Leptocodon gracilis*, a fragile climber with blue flowers rambled over bushes everywhere. I collected many specimens of *Pleopeltis rhynchophylla* from a tree at the end of the Lachung cane bridge.

The hill above Choongtam ascends abruptly to 10,000 feet, and is almost entirely clad with grass alone. It forms the termination of a lofty range running southwards from Kinchinjhow, and divides the Lachen and Lachung valleys. The Tibetans aver that this long spur possesses but one practicable pass, namely the Sebo La between Momay Samdong and Tungu; but by dint of persistent enquiry I discovered that there are at least two more—one from Lachung to somewhere near Latong, the other from Yeumtong to Tallum Samdong. I was informed that they are rarely used, a fact explained by the lack of the necessity of frequent intercourse between the inhabitants of the two valleys.

From Choongtam we marched to the village of Lachung in one day. As far as Keadom the valley is narrow, and the path runs along the river bank for most of the way. Here the valley expands into a large flat, with an elevation of 6,600 feet, which enjoys such a warm and sunny climate that maize, millets and other tropical crops are successfully cultivated. Onwards the valley again becomes narrow, but two or three miles below Lachung it broadens considerably and remains open for some miles above the village.

A large proportion of subtropical trees and plants ascend to a short distance above Keadom. These are succeeded by a dense shrubby vegetation of *Hydrangea*, *Rosa macrophylla*, and *R. sericea*, *Prinsepia utilis*, *Pyrus*, *Pieris ovalifolia* and *P. formosa*, *Zanthoxylum*, *Rhododendron arboreum*, *R. ciliatum* and Maples, etc. Other plants are *Leycesteria formosa*, *Buddleia macrostachya and B. Colvillei*, *Berberis*, and *Rubus niveus* with palatable fruits. *Roscœa alpina*, the Box-like *Sarcococca pruniformis* are in great quantity. The handsome fern *Osmunda Claytoniana* overruns large areas in the manner of Bracken at lower elevations. Two species of *Leucostegia*, *L. Hookeri* and *L. membranulosa*, with sweetly hay-scented foliage, and a large stipitate form of *Pleopeltis simplex* grow in a wood at about 8,000 feet. *Goniophlebium ebenipes* was in dense clusters on the tops of many of the numerous rocks.

This locality is eminently distinguished by its variety of Coniferous trees. *Abies Webbiana*, the dominant species on the humid mountains of the Singalelah and Chola Ranges, even here maintains

its supremacy in numbers. It ranges from 9 to 13,000 feet. Up to 11,000 feet it grows intermingled with the other lighter foliaged pines, but from that elevation to its highest limit, it exists alone or associated with the equally dark coloured *Juniperus pseudo-sabina*, so that nothing breaks the monotony of their sombre aspect on the slopes which they clothe with their lofty forests. *Juniperus pseudo-sabina* and *J. recurva* are the two last representatives of arboreal vegetation, both attaining 15,000 feet, the former as a small, stunted, weather-worn tree, the latter, as a prostrate intricately branched shrub. Large quantities of planks cut exclusively from *Abies Webbiana* are annually exported to Tibet. Their preparation is an important industry of the inhabitants of Lachung, who shape the timber with no other appliances than the axe and wedge.

Picea Morinda and *Tsuga Brunoniana* are found between 8 and 11,000 feet. The former is a tall conical tree with thick trunk and dark green pendulous branches, the latter has spreading branches drooping at the extremities and bears very small cones *Larix Griffithii*, the only Himalayan Larch, is restricted in its distribution to Eastern Nepal, Sikkim and Bhutan; and, previous to its re-discovery by Sir J. D. Hooker, its existence was only known from a notice in Griffith's journals. It is pyramidal in outline and attains a height of sixty feet. The branches are long and pendulous and support erect cylindrical cones closely resembling those of *Picea Morinda*. It first appears at 8,000 feet, becomes plentiful at 9,500 feet, and ascends to 12,000 feet. It is the only deciduous conifer in Sikkim, the leaves falling in autumn to be renewed in the beginning of the following summer.

The peach and apricot, introduced from Tibet, are cultivated by the villagers at Lachung, but in no great quantity. I was informed that the fruits of both ripen in the end of September. *Pyrus sikkimensis*, a wild Crab-apple tree, is common, but its austere fruit is only pleasantly edible when stewed with sugar. A little barley is reared with radishes and turnips, and these were the only vegetables I could obtain worth eating; the scanty yield of potatoes consisted of wretchedly small tubers, so waxy as to be nauseating when cooked.

The Tankra Mountain was within easy distance of Lachung, and as it promised a quick introduction to the Alpine Flora which I was so anxious to see, I determined to visit it at once. We crossed the Lachung river, threaded our way through the narrow dirty lanes of the village, and immediately climbed up the grassy slope above it. For about a mile the path runs through a dense herbaceous vegetation composed of the plants I formerly enumerated at Lachung. A beautiful small pink lily—*Lilium roseum*—grew profusely on banks

associated with *Roscœa alpina* and *Drosera peltata*. At 9,500 feet we passed through a fine grove of small trees of Rhododendrons, Maples, Roses, *Lindera Neesiana*, *Betula utilis*, and the laurel-like *Daphniphyllum himalayense*. In a mossy hollow within this wood, I found a large quantity of the delicate little fern, *Polypodium trichomanoides*. *Goniophlebium subamœnum* depends from the trunks of silver Fir; and *Goniophlebium erythrocarpum*, another epiphytic fern, accompanies arboreal vegetation to the end. Passing the grove we entered the magnificent forest of pines which extends without a break to 12,500 feet. We marched to its upper skirts, where we camped after clearing a sufficiently large plot of ground near a stream winding through an expanse of Rhododendrons. Two species of *Cremanthodium*, *Polygonum vaccinifolium*, *Oxyria digyna*, *Pedicularis* of various species, *Potentilla fruticosa*, beautiful yellow and white Saxifrages, *Epilobiums*, *Lactuca macrantha* *Parnassia* and Aconites were the commonest plants observed.

The following day we held on our course upwards. The region of trees was soon left in the rear, and a low growth of *Rhododendron campanulatum* succeeded, showing the dark glaucous tints of its unfolding leaves. The bladder headed *Saussurea* (*S. obvallata*) thrives on the damp margins of watercourses, and bumble bees were busy amongst its fœtid flower heads. These are in clusters of a dark brown colour, enclosed in inflated white papery bracts forming an ovate head, and yielding sufficiently to allow insects to insinuate themselves with ease. The woolly headed *Saussurea* (*S. gossypiphora*) delighting to grow in sandy debris appeared at first sight to be only a ball of white fleecy wool The flower heads when young are completely enveloped; but on the approach of maturity a ring opens on the top disclosing the inflorescence inside. Another remarkable plant, in similar situations, is *Crepis glomerata*, whose carrot-like stem buried in the ground is flattened on a level with its surface, and bears a broad head of yellow flowers, surrounded by small radiating leaves pressed closely to the soil. *Rheum nobile* is visible on the faces of all the cliffs around, and ascends to 17,000 feet.

Our third day's camp was pitched below the ascent to Kanko La, which passes at the gorge, cut by the river through a low line of cliffs, forming a barrier across the head of the Tankra Choo Valley.

The next day we crossed this by the frequented path, and followed the track to the Tankra pass, which is at an elevation of 16,000 feet. The terminal valley slopes gently to the pass, is exceedingly rocky, and is bounded by snowy ridges; and much snow lay in its hollows. The rounded surface of the pass is a conglomeration of sand and

boulders which are constantly sliding down from the crags on either side.

On the Tibetan side, a narrow grassed valley descends steeply. Fog effectually prevented a more extended view. Between the Kanko La and the barren glacier below Tankra La there was a multitude of bright-hued flowering plants. Brown and yellow *Chrysosplenium*, yellow Saxifrages, blue and yellow forms of *Corydalis*, a few species of *Pedicularis*, beautiful small primroses—*P. uniflora*, *P muscoides* and *P. soldanelloides*,—*Ligularia*, *Rheum nobile*, some blue Gentians, and the bladder headed *Saussurea* were the most notable. The plants I found on the pass are those enumerated by Sir J. D. Hooker. In addition to his list, I may state that *Meconopsis horridula*, a lovely plant affecting only the most inclement situations, was collected in full bloom from under the shelter of rocks. I stayed for two hours at the pass in the vain hope of the fog lifting to give me a better view. During this time the continuous winds were most variable, and the variability was rendered more obvious by the way in which vapour was deposited by different currents. The wind which blew from the Tankra Valley on the south-west brought hail and snow, that from the south-east in Tibet precipitated rain. The same meteorological conditions prevailed during Sir J D. Hooker's visit. The Tankra La lies south of the summit of Tankra mountain, to the east is a long rocky ridge cleft by the minor pass of Kanko La ; and between this and the culminating peaks is a large, shallow basin with undulating surface through which flow the headwaters of the Tankra river. Those on the north spring from many points under snow fields, that on the south-east rises below the pass and is immediately lost in the great central moraine, re-appearing at its lower end as a large and swiftly flowing torrent. It is joined near the Kanko La by the united streams from Tankra ; after effecting the junction, the river turns sharply to the west through the deep and narrow defile of the pass and hastens precipitately downwards for some miles until it debouches in the Lachung river a little south of the village of that name. From the Kanko spur to the limit of Pines at 13,000 feet, the valley is broad and shallow ; here it suddenly narrows and remains so to its termination. During the week I spent on this excursion, the weather was uniformly boisterous and wet, while those of my party who remained below at Lachung asserted that they had enjoyed calm sunny days and clear nights.

The fragrant spikenard (*Nardostachys Jatamansi*) is plentiful on Tankra, and the Scrophularineous plant *Picrorhiza Kurrooa*, intensely bitter when chewed, is abundant about 14,000 feet, and is held in much repute as a febrifuge and tonic. The only woody plant above 15,000 feet is the humble *Diplarche pauciflora*.

I returned to Lachung, where I halted for a week to dry the numerous specimens collected during the excursion to Tankra La, and also to make preparations for a journey to the Donkia Pass at the head of the Lachung Valley, and the most northern point I could reach in Sikkim.

We started on the 13th August, and arrived at Yeumtong the same day. The path runs close to the west bank of the Lachung river the whole distance. About half way we crossed an enormous landslip which had partly buried a large forest of *Abies Webbiana* and Larch.

The interesting feature of this day's journey was the extensive Pine woods through which we travelled. On the western slopes they grew down to the verge of the stream, and every tree was festooned with long gray streamers of the Lichen *Usnea barbata*. I was told that, when reduced to great straits, the Tibetans made use of this unpromising plant as food; when boiled it was said to be gelatinous and palatable, and as nourishing and life-sustaining as beef.

We saw many tailless rats, but I was prevented from procuring specimens by my desire to respect the superstitious notions of the Tibetans and Lepchas regarding them. I was told, with every appearance of belief on the part of my informants, that the killing of one of these animals was certain to be followed by storms of snow or rain according to the season of the year, and many instances of personal experience were related to me in corroboration of the fact. The Tibetans are reminded of the near approach of winter when they observe these rats busy themselves in preparing their winter quarters.

The valley is wide as far as Yakcha; it there narrows for a considerable distance, broadening into large swampy flats intersected with streams towards Yeumtong. The spurs on the western flank are precipitous rocky and sterile, supporting vegetation only at their sheltered bases, but forests clothe the opposite side with the verdure. Every mountain mass in this region facing a southerly direction in the least degree is, in summer, exposed to the full force of the damp southerly winds laden with mist which blow with increasing violence as the day advances, to die away only at night. These continuous currents rapidly disintegrate the surface, washing down the superincumbent earth and wearing away rocks which become precipices or crags of fantastic shapes. Vegetation, therefore, cannot find permanant foot-hold under such circumstances, and its abundance is confined to the sheltered flanks where a copious rainfall is absorbed by the deep and fertile soil.

The increase of 3,000 feet in elevation between Lachung village and Yeumtong causes the appearance of many new plants along the

route. Composites become more numerous and gregarious. *Inula Hookeri* beautifies dry knolls with its densely leafy stems and large heads of yellow flowers. *Erigeron multiradiatus*, some species of *Senecio*, *Anaphalis* and *Aster* are equally plentiful. Various *Thalictrums* and *Halenia elliptica*, all with blue and white flowers, grow in the grass and low thickets. Orchids are well represented by many *Habenarias*, *Satyrium*; and the small purple *Orchis Chusua* (allied to the common *O. latifolia* of England). The Monkshood was flowering and attained a height of 6 feet in flat grassy fields. Cattle and horses are allowed to graze at large in places infested with this plant, but sheep and goats do not possess the same instinctive knowledge of its poisonous properties, and great care has to be exercised by the shepherds when driving them through these localities.

Myricaria germanica, *Allium*, *Meconopsis simplicifolia*, whose spikes 3 feet in height greatly excel the stunted specimens seen on Singalelah, the large wild Rose (*Rosa macrophylla*), with bright red fruits, and shrubby Berberries, were all common.

The following day was Sunday, so I halted at Yeumtong. The tents were pitched between the huts and the river which flows tranquilly in a broad shallow bed down the whole length of the flat. Opposite is the snowy mountain with a glacier reaching a lower level than any other in Sikkim as Sir J. D. Hooker mentions; a thick turf of grass covered the surface of the flat. A yellow anemone (*A. obtusiloba*), with leaves appressed to the ground, a surculose Saxifrage; the Dandelion, *Taraxacum officinale*, the aromatic yellow *Elsholtzia eriostachya* and groups of brilliantly yellow flowered *Senecio diversifolius* gave colour to the scene. A small swamp north of the camping ground was brightened by the yellow flowers of *Pedicularis tubiflora*, and a small floating *Ranunculus*, and beyond, in a small wood of silver fir, I found many specimens of *Meconopsis simplicifolia* and *M. nepalensis* in fruit. I collected a large supply of seed from the former, but nearly every capsule of the latter had been destroyed by a small white caterpillar. Neither species ever grows in the open, both preferring the shelter afforded by rocks or small bushes on the skirts of the thickets. The commonest plant was *Cnicus eriophoroides* with strongly spinose leaves which penetrate the thickest cloth, and cause a smarting sensation in the skin. Other plants were *Salvia glutinosa*, *Lychnis nutans*, *Cucubalus baccifer* and *Asarum himalaicum*.

Aroids of the genus *Arisæma* are common. In early summer their tuberous roots are prepared and used for food according to the method described by Sir J. D. Hooker. I was presented with a few glutinous cakes made in the most approved style, but the taste was

so peculiarly disagreeable that I could not persuade myself to eat more than one mouthful.

Yeumtong is a large cattle grazing station and depôt for Tibetan exports and imports. Communication thus far from the lower valleys is kept open by the people of Lachung who carry loads of planks, bamboo, rice, dye-stuffs, such as the leaves of *Symplocos* and the roots of *Rubia cordifolia*, which are transported by yaks to Tibet. In exchange the Tibetans bring down loads of salt, barley, blankets and other commodities for the inhabitants of Lower Sikkim. I could not ascertain how many yak loads of merchandise are carried annually over the Donkia Pass, but every day during my stay in this part I saw herds of at least 10 or 12 yaks, and often many more either going or returning. Looking northwards from Yeumtong, the slope of the valley to an elevation of 13,000 feet is easy and is black with pine forests. Above, the land is red and sterile. On the west a tributary stream flows from behind Changokhang along the base of a long declivity of sand. The view higher up is cut off by jutting spurs below Momay Samdong.

The following morning we marched to Momay Samdong, elevation 15,300 feet. The first and the last two miles of the path are easy, but the intervening portion is steep. A forest of Silver Fir, Maple, Birch, Pyrus, Rhododendron and other trees extends to 13,000 feet; for a few hundred feet further some scattered black Juniper trees occur; an equal distance is occupied by Rhododendrons and Willows, and passing the spurs which terminated the view from Yeumtong, the valley is broad with enormous rocks on its surface, and the surrounding hills are rocky. I have nothing to add to the excellent description of this spot by Sir J. D. Hooker, but a place with more inhospitable surroundings can scarcely be imagined. A few yaks were grazing, the sole survivors of large herds almost annihilated by an epidemic of rinderpest, which raged during the previous year.

This great calamity had impoverished the inhabitants of the valley, as for the greater part of the year they depend for sustenance on the curds and cheese made from the milk yielded by their flocks.

As the morning of the 10th August was bright and sunny, holding out hopes of a fine day, a promise unfortunately not fulfilled, I set out for the Donkia Pass, seven miles from Momay, and the most northerly point I could reach in Sikkim. The tracks lead through a waste of stupendous rocks, and the stream becomes divided into many channels. The hills rising around it are masses of rock and rubble, forming a most forbidding landscape in the aggregate. The shallow waters support an abundance of reddish *Sedum* and *Rheum*

nobile. Myriads of blue Gentians unfolded in the brief glimpse of sunshine we enjoyed, and *Allardia glabra* grew in low dense tufts, bearing large sessile flowers with yellow disks and purple rays The musk scented *Delphinum glaciale* ascends to 17,500 feet accompanied by *Aconitum Napellus* reduced in size to a small plant with two or three leaves bearing but one short pedicelled flower. Other plants were *Ranunculus lætus*, *Cyananthus* of two species, the Edelweiss (*Leontopodium alpinum*), *Erigeron*, *Cremanthodium reniforme*, *Lactuca Dubyœa*, *Crepis glomerata*, *Saussurea*, and the curious lichen-like *Antennaria muscoides*. *Rhododendron nivale* and *Ephedra vulgaris* were the only woody plants. The feature of the vegetation from 17,000 feet upwards is the prevalence of plants growing in dense hard hemispheric tufts such as *Arenaria*, *Saxifraga*, *Saussurea*, *Astragalus*, and *Myosotis Hookeri*. The last steep ascent to the pass 18,100 feet elevation, is devoid of vegetation. The view across Cholamoo to the Kambajong mountains was clear and we were able to appreciate fully the graphic account of this wonderful region which Sir J. D. Hooker gives in such perfect detail.

My orders forbade the crossing of the Donkia, so I returned to Momay in the evening through a blinding storm of snow and rain.

As I was anxious to penetrate to the Lachen Valley through the Sebo La, I waited at Momay for a week in order to obtain good weather for the attempt, but the cold south wind drove a thick mist and drizzling rain without intermission, and I was compelled to relinquish the idea. One day I went eastwards to the great glacier of Kinchinjhow. Passing the hot springs noted by Sir J. D. Hooker, and climbing to the crest of the terminal moraine, we walked along the top of a lateral one leading far into the snowy billowy mass of the glacier. I was surprised to find many plants flourishing in such a bleak place. *Eriophyton himalaicum* was common. It is a white woolly *Labiate* with bright blue flowers peeping from under the leaves; I have never observed it but on dry sandy slopes. The other plants were a minute *Saxifraga* with extensive runners, a small *Gentian*, *Pedicularis* of three species, *Festuca* and *Carex*. *Rhododendron nivale* was dead and withered, having probably been killed by the severity of the previous winter, but, strange to say, *Potentilla fruticosa*, in its largest and most developed form, and not the creeping variety we should expect to find here, was covered with flowers and foliage and was as much at home amongst ice and snow as it is at the more temperate elevation of 10,000 feet. From Momay Samdong I returned to Yeumtong and halted there a few days. I ascended to the glacier on the opposite side, which Sir J. D, Hooker failed to reach through the gorge. Now-a-days there is a cattle track leading to the high pastures, so that progress is easy.

Rosa sericea is the commonest shrub in the pine forest and *Salix Wallichiana* and *Pyrus microphylla* are abundant. Between the summit of the first ridge and the glacier, the path runs along the side of the stream, the rest of the area is too encumbered with boulders to be walked on with safety. Above 13,000 feet the forest of silver fir is replaced by impenetrable Rhododendrons, and a few stunted trees of black Juniper. There is little variety in the herbaceous vegetation, the biting air radiating from the glacier being too chilly to suit even cold-loving plants. *Podophyllum Emodi* yielding red fruits eaten by the Tibetans, *Swertia Hookeri*, *Rheum acuminatum* and *Cnicus eriophoroides* were conspicuous by their abundance and size.

The weather at Yeumtong was also uniformly wet and miserable, so I started for Lachung on the 20th August. Arriving the same day I stayed to dry my collections and to make arrangements for an excursion through the Sebu Valley to Ghora La, a part as yet unvisited by any naturalist to my knowledge.

In his "Himalyan Journals" Sir J. D. Hooker notes "about five miles above Lachung the valley forks, the eastern valley leads to lofty snowed regions, and is said to be impracticable." A lofty precipice at the immediate entrance to this valley, and on its northern flank, attracted my attention. On enquiry, I discovered that one of my men had ascended to Ghora La, the first pass from the northern end of the longitudinal range which extends from Donkia to Gipmoochi, and forms the eastern boundary of Sikkim. From a distance the forbidding aspect of this valley would naturally lead one to conclude that to explore it would be a matter of great difficulty and danger. It is almost useless to interrogate the Tibetans as to the feasibility or otherwise of ascending any comparatively unfrequented valley, as their jealous exclusiveness prompts them to overrate natural difficulties in the hope of deterring Europeans and other strangers from exploring the various practicable routes to Tibet. The path to Ghora La runs up the valley of the Sebu river, a large and turbulent stream. I was informed that this valley is held in considerable veneration by the Tibetans on account of the lofty and unique precipice guarding its entrance, for the sacred mountain of Donkia at its head, and also for the sacred inscriptions which were carved on the face of a cliff half way up the ascent to Ghora La; but this last feature is now completely obliterated, as the whole face of the rock has fallen down. At the summit of the pass, and visible from a considerable distance, is an irregular pillar-like rock, which I was told is the figure of a god, but its real character was apparent on closer inspection.

Leaving Lachung on the morning of the 3rd September, I took the following route. The Lachung valley path was taken for three miles to the village of Yakcha. Here the track to Ghora La breaks off abruptly to the north-west, a direction which is pursued more or less the whole way. A short walk through a forest, containing beautiful Conifers, *Picea Morinda*, *Tsuga Brunoniana*, *Larix Griffithii*, brought us to the Lachung, which is crossed by a good wooden bridge. On the other side it is steep for a short distance, and afterwards the path runs almost level over somewhat swampy ground. The river Sebu, which, from its source downwards, is a swiftly flowing torrent coursing through a boulder-strewn channel, here becomes broader, shallower and more tranquil. Small willow-trees fringe its banks, with *Euonymus* and *Ilex intricata*, while *Thalictrum* is specially abundant. Beyond this, a sudden ascent is made along the base of a stony precipice with *Woodsia lanosa* growing in its clefts; and a little further on I found its allied species *Woodsia elongata*, the only occasion I recollect of their association, as the former affects a more alpine elevation as a rule. The remainder of the day's march was steep through a large forest of silver fir, until we arrived at the first convenient camping ground, a cattle station named Sebu, artificially formed by a clearance in the forest. Here *Ainsliæa pteropoda*, *Heracleum*, and *Galeopsis Tetrahit* monopolized spots untrodden by cattle.

The northern side of the valley is enclosed by a continuous precipitous spur, broken in one place only by a deep forest-clad depression. At the foot of the chief one at the commencement of the valley, is a small temple where services are held on certain days of the year. The range on the other side being more gently sloped, is covered with forest and succeeding smaller vegetation, and is more diversified by ravines

Of trees which do not extend above 10,500 feet in this valley, are *Picea Morinda*, *Tsuga Brunoniana*, *Larix Griffithii*, *Prunus Padus*, *Pyrus lanatus*, *Pyrus sikkimensis*, *Hydrangea*, *Ilex dipyrena*. Above this elevation to 13,000 feet is a continuous forest of *Abies Webbiana* associated with Maples, Birch, *Viburnum*, *Berberis*, and *Rhododendron*; *Aconitum Napellus* grows luxuriantly on the grazing ground at Sebu.

At 11,000 feet large trees of *Juniperus recurvus* appear, and at 13,000 feet (the upper limit of *Abies Webbiana*), and for a short distance above it they form the only arboreal vegetation.

From 13 to 15,000 feet there is an impenetrable growth of Rhododendrons and Willows, with numerous small trees of *Pyrus foliolosa*, and *P. microphylla*; and, intermingled with grass under-

neath these bushes, is an equal luxuriance of herbs, such as *Aconites*, *Senecios*, *Saxifrages*, *Primulas*, *Potentillas*, *Polygonums* and *Thistles*. *Cnicus eriophoroides*, which is moderately common in most valleys, is so abundant here as to be a perfect pest.

From Sebu (12,500 feet) the next march was to a yak grazing-station named Sethang, at an elevation of about 15,000 feet. Up to 14,000 feet the floor of the valley is very steep, but about 1,000 feet below the level of Sethang we emerged on a swampy flat, through which the Sebu flows in several channels. Its surface is covered with grass, and its borders are cumbered with *Rhododendron Anthopogon*. A tributary from the west pours over the hollow of a precipice in a magnificient waterfall. Above the plain is a steep rocky barrier thrown transversely across the valley. On reaching its summit we arrived at the camping ground. The coolies took up their quarters in the deserted huts, and my tent was pitched near an accumulation of enormous boulders. A small muddy pond lies at the upper end of the flat.

Here the two branches of the river Sebu unite—one rising in Donkia, the other in the nameless snowy mass south of Ghora La. The former is seen flowing in a deep and narrow gorge; the latter rushes down a steep rocky transverse slope similar to that which we ascended below Sethang. These slopes run parallel to each other, and are probably the terminal moraines of the glacier, which is now confined to the head of the valley. *Rhododendron companulatum* is the common shrub. *Primula Stuartii*, *Meconopsis nepalensis*, *Geranium collinum*, all in fruit, abound on the flat.

On the following morning I walked to Ghora La, elevation 17,000 feet. The path descended into the stream from the Donkia, the ascent beyond winding amongst gigantic boulders on the western side of the slope. At the top is another small plain, and the remaining portion of the valley becomes broader and ascends by a long easy gradient to 16,500 feet.

The valley from this point onwards to near its head is bounded by even ridges and unbroken slopes which are possibly the lateral moraines of the ancient glacier terminating below Sethang.

Both seemed to be elevated 500 feet above the river. A broad terrace runs along the base of the eastern one for some distance. Higher up, the valley expands and the stream again divides. The eye following the course of the western branch, is carried to the snowy mountain of Forked Donkia from whose feet a glacier spreads out over a large area.

There is an accumulation of rocks and sand at the eastern termination of the glacier, and its waters feed a lake white with suspended

silt. This mountain is an object of worship and veneration, and votive offerings of prayer printed cloths fluttered on the banks of the lake. Between Forked Donkia and the pass is a shivered line of crags devoid of snow; the pass itself is an extremely narrow gap with sheer rocks rising sharply on either side. Its final ascent is occupied by a glacier which widens out eastwards into an enormous field of ice under another snowy mountain. The actual ascent of the pass is commenced at a small pool at the end of the glacier. There is no permanent path amongst the shifting mass of rocks, so we had to make our way as best we could up the lateral moraine of loosely poised boulders. Half way up we took advantage of a small snow-field. The last hundred yards was over the glassy surface of the ice in which we cut steps as we advanced.

The available standing room on the pass would scarcely suffice for ten men, and the descent on the Tibetan side is startling in its steepness. Its surface was covered with a shoot of stones. This pass is not practicable for the passage of yaks, and is seldom used by foot travellers. On the north a high naked hill projected eastwards, appearing as a huge pile of stony debris; on the south a large glacier descended. Below lay the broad open grassy valley of the Ridu Chu; beyond were a few isolated rounded peaks surrounding elevated plateaux of large extent, and further back still were mountains of the same dull red colour running east and west, while over them hung heavy masses of clouds which obscured more distant views. The lower part of a snowy mountain, said to be Chumulhari, was seen in the far east.

The district we overlooked is called Kamboo. Medicinal hot springs of great repute occur in it. Phari is to the south-east of Ghora La, but is hidden behind intervening ranges.

The vegetation above 15,000 feet in the Sebu valley is very scanty. *Sedum* of two or three species, *Saxifraga*, *Allardia*, *Meconopsis horridula*, *Cyananthus*, *Gentiana*, *Saussurea* of three species, *Ephedra*, *Rhododendron nivale*, and a few other plants, principally grasses and sedges form the bulk of the vegetation. *Rheum nobile* grows on the surrounding otherwise sterile heights, reaching to an elevation of 17,000 feet.

We found a woolly *Saussurea* (*S. tridactyla*) at the foot of the ascent to the pass, but from thence upwards not even a lichen was visible. This *Saussurea* and *Antennaria muscoides* are supposed by the Tibetans to be the most esteemed of their gods as incense. The plants used in temples are *Rhododendron Anthopogon* and *R. setosum* and a Juniper. I could not obtain definite information as to the derivation of the name "Ghora." I was first told that the sacred

pictures carved near it suggested its name, and I concluded that the name was a contracted form of Gorucknath; afterwards it was explained that the meaning was "winding" in allusion to the winding route to the pass.

Yaks are grazed from 14 up to 17,000 feet in this valley during the summer, and at Sebu I found a large herd of cattle.

From Sethang I returned to Lachung in two marches, arriving on the 8th September.

The time until the 14th was devoted to arranging and packing my collections and luggage. We returned to Tumloong by the Teesta valley path and arrived there on the 20th September.

Third tour. The Chola range.—I left Tumloong on the 22nd September for my third and last excursion. The first march was to Rungpo, elevation 6,000 feet, a halting stage of the Sikkim Rajas during their journeys to and from the Chumbi valley, their favourite summer resort. The path descends through cultivated fields to the beds of two arms of the Ryott river which unite a little further down. They are crossed by cane suspension bridges. The succeeding ascent is steep and passes through many fields of dry-ground rice and millet. An edible variety of Job's tears (*Coix lachryma*) is grown near watercourses. The whole valley is thickly populated, and the inhabitants practise a careful system of cultivation.

An oak (*Quercus semecarpifolia*) is common at Rungpo, but the rest of the vegetation is of the usual type at this elevation.

Onwards to Chola Pass the marches were made eastwards up a continuously steep ridge. The second day's journey brought us to Laghep (10,400 feet), a small cattle station with a camping ground on a projecting knoll covered thickly with *Iris nepalensis*. This locality is celebrated for its variety of Rhododendrons, every species existing in Sikkim, excepting *R. nivale*, being found within a distance of two days' short marches. It was too early in the season to obtain seeds, as they do not ripen until November.

The plants of *Decaisnea insignis* which Sir J. D Hooker observed at at 7,000 feet still grow abundantly there.

The next day's march was a short one to Pheyeunggong, 12,400 feet, a large flat-topped peak where the *Abies Webbiana* is first seen. Beyond Pheyeunggong we descended to the Rutto river, where we found quantities of *Cathcartia villosa* in fruit. This plant is extremely local in its distribution, being found only in this small valley and in one small area near the summit of Lingtu. The ascent continues along the broad valley of Rutto, which becomes bleak upwards. *Abies Webbiana*, however, attains an elevation of 12,600 feet at Chamanako, where we halted.

The first part of the ascent to Chola Pass is very steep, an easy path then leads to the next ridge beyond which is a small and pretty lake. A second slight ascent brought us to another small lake, and a pond lies immediately beneath the pass. The summit of the pass is rounded, and its surroundings are barren rocks. On the Tibetan side a narrow gorge-like valley descends sharply. Snow had fallen the previous night, descending to 13,000 feet. We left Chamanako on the 28th, and resumed our journey along the Chola Range. The path follows the course of the Rutto for half a mile, then crosses it, and an ascent to 14,000 feet follows, through a scrub of Rhododendrons. At 14,000 feet there is a large hollow covered with Rhododendrons, containing two lakes, the larger ovoid in shape, the smaller long and narrow. Attaining the ridge beyond, we descended to the river Rungpo, passing through on the way a narrow defile walled with rock. Another ascent through small Rhododendrons again followed, after which we descended and struck a path from Guntok. We walked along this for a mile, and reached the camping ground named Buthan, a large expanse of green turf closed in on the east by a barrier-like cliff.

During this march we found specimens of *Chrysanthemum Atkinsoni*, the only example of the genus occurring in Sikkim, some small Saussureas with fern-like leaves, Primroses, Parnassia, the Bladder-headed Saussurea, *Senecio amplexicaulis*, and the small Rhuharb, *Rheum acuminatum*.

The following day we marched to Kapup, a small plateau under Zeylap La. We ascended to the top of the rocky barrier east of the camp. From here we obtained a magnificant view of a long trough-like valley terminated by a ridge beyond Kapup. The whole scene was of a warm brown colour from the herbaceous vegetation killed by the late autumn frosts. This valley, which runs southwards, is bounded on the north by the main Chola ridge which forms the political boundary between Sikkim and Tibet. There was a long gradual descent down this remarkable valley, in which are two marshy lakes of considerable extent. Beyond the second lake a deep narrow gorge intervenes. This is clothed with Pine forest, and at the end of the valley the meeting of two opposite spurs hold back the stream so as to form a large lake reflecting the pine woods on its dark tinted surface. Surmounting the ascent from the stream, we emerged on the grassy flat of Kapup with a few scattered silver fir trees, small Rhododendrons and shrubby *Berberis* in its sheltered parts. The Spikenard, *Nardostachys Jatamansi* was common, but few plants grew in the closely cropped herbage.

On the 30th September I walked to the pass, and returned through Kapup to Gnatong. No vegetation exists at the pass itself,

and that below it was fast withering. At Gnatong the plants still in flower were *Onosma, Senecio*, and a few species of *Saussurea, Swertia* and *Saxifraga*. From Gnatong I travelled by the military road to the Teesta Bridge, arriving at Mongpoo on the 5th October.

During the whole of this excursion I had only one fine day, namely, the 28th September. A dense fog with drizzling rain prevailed to my disappointment during the rest of the time, which prevented me from noting the details of the scenery I passed through.

G. , C. P. O.—No. 239 R. & A. D.—1-2-94.—266

8124